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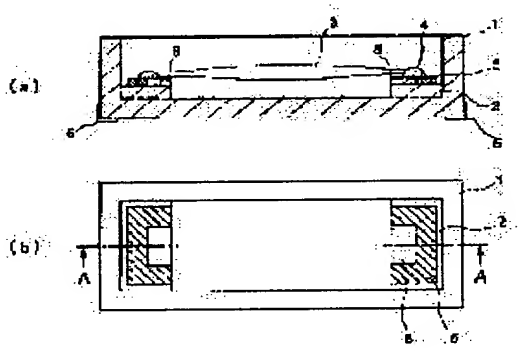
(54) STRUCTURE OF CERAMIC PACKAGE

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a ceramic package having a structure which makes improvement of adhesion strength possible between a gold electrode on a mount part provided in the inner bottom part of a ceramic package and conductive adhesive.
SOLUTION: In this package, a ceramic mount part 2 is provided in the inner bottom part of a container 1 formed of ceramic and a metallic electrode film 5 which ensures conduction with outside and has a gold plating layer in a surface layer is provided in the upper surface of the mount part 2, and the package is constituted to fix a quartz element board and a gold parting layer with conductive adhesive 4 and bring them in a continuity. It is constituted to reinforce adhesion between the metallic electrode film 5 and a quartz element board by bonding an exposed part 8 of ceramic obtained by removing at least a part of the metallic electrode film 5 and the conductive adhesive 4.



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CLAIMS

[Claim(s)]

[Claim 1] The mounting section made from a ceramic is prepared in the inner pars basilaris ossis occipitalis of the container formed with the ceramic. In the ceramic package constituted so that it might be a metal-electrode film for securing a flow with the exterior in this mounting section upper surface. a thing with the gold plate layer might be prepared in a surface and it might be made to fix and flow through a crystal blank and a gold plate layer in an electroconductive glue Structure of the ceramic package characterized by constituting so that the adhesive strength between a metal-electrode film and a crystal blank may be reinforced by pasting up the outcrop and electroconductive glue of a ceramic which were obtained by removing some above-mentioned metal-electrode films [at least].

[Claim 2] The mounting section made from a ceramic is prepared in the inner pars basilaris ossis occipitalis of the container formed with the ceramic. In the ceramic package constituted so that it might be a metal-electrode film for securing a flow with the exterior in this mounting section upper surface. a thing with the gold plate layer might be prepared in a surface and it might be made to fix and flow through a crystal blank and a gold plate layer in an electroconductive glue While having the metal-electrode film which carried out the laminating of the golden thin film to the nickel layer one by one on the tungsten layer formed on the above-mentioned mounting section By fixing a ceramic layer on the tungsten layer of the next door of this metal-electrode film. and pasting up the outcrop and electroconductive glue of a ceramic which were obtained by removing some above-mentioned metal-electrode films [at least] Structure of the ceramic package characterized by constituting so that the adhesive strength between a metal-electrode film and a crystal blank may be reinforced

[Claim 3] Structure of a ceramic package according to claim 1 or 2 where the above-mentioned outcrop is characterized by consisting of small area and two or more outcrops.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] Especially this invention relates to the structure of the ceramic package which raised the electrical installation nature of the mounting section formed in the base in a ceramic package in order to support piezo-electric blanks, such as a crystal blank, and this piezo-electric blank about improvement of the package structure of a piezo-electric device.

[0002]

[Description of the Prior Art] Small and light-ization of electronic equipment of **, such as various communication equipment and OA equipment, follows on progressing, a miniaturization is required also about the piezo-electric device which are built-in parts, and the surface mount type thing by which covering formation of the electrode was carried out is variously developed to the package exterior instead of the thing of the conventional lead type with which the long picture lead terminal was drawn by the package exterior as latest piezo-electric device. Moreover, it is more advantageous to have not supported a piezo-electric blank in the piezo-electric surface mount type device, on the exceptional substrate prepared in the package like the former as a internal structure of a piezo-electric device, in order to correspond to thin shape-ization of a device, but to adopt as the pars basilaris ossis occipitalis in a package what made the direct piezo-electricity blank the structure (direct mounting structure) fixed by electroconductive glues, such as silver filler adhesives. For example, in the piezo-electric device using the crystal blank as a quartz resonator, as shown in drawing 8 and drawing 9 , after fixing the crystal blank 3 by the electroconductive glue 4 on the metal-electrode film 5 prepared on the mounting section 2 which are two projected parts prepared in the inner pars basilaris ossis occipitalis of the container 1 formed with the ceramic, the ceramic package which closes up opening of a container 1 with a metal or the lid of a ceramic is common. Generally this metal-electrode film 5 is formed on the mounting section 2 of a ceramic by carrying out the laminating of a tungsten layer, a nickel-plating layer, and the gold plate thin film one by one. Conductivity of gold is good and the reason for making a gold plate thin film layer into a surface is the shell which cannot oxidize easily. However, since the junction force of gold with a tungsten is weak, it is making the nickel-plating layer intervene as an interlayer. the connection which is not illustrated to the external electrode 6 which formed the metal-electrode film 5 in the package exterior -- it connects through the conductor That is, the crystal blank 3 is fixed in the container 1 which the metal-electrode film 5 was beforehand formed on the mounting section 2 of the inner pars basilaris ossis occipitalis in the container 1 formed with this ceramic, and put the crystal blank 3 after applying the electroconductive glue 4 on the golden thin film which constitutes the surface of the metal-electrode film 5, as shown in drawing 2 , was made to harden the aforementioned electroconductive glue 4 by heating, and was formed with the ceramic. Then, it becomes a finished product as a piezo-electric device by closing opening of a container with a lid.

[0003]

[Problem(s) to be Solved by the Invention] However, if it was in the piezo-electric device of structure conventionally [above-mentioned], since the connection resilience of a crystal blank and the golden thin film which is the surface of the metal-electrode film 5 was not necessarily enough, when vibration and the shock were added to the piezo-electric device, the fault that a golden thin film and an electroconductive glue 4

exfoliated, and vibrator became a misfire occurred frequently. It is made in order that this invention may prevent generating of the fault of the piezo-electric device which used the package of the **** former mentioned above, and it aims at offering a ceramic package with the possible structure of improving the bond strength of the golden electrode on the mounting section prepared in the inner pars basilaris ossis occipitalis of a ceramic package, and an electroconductive glue.

[0004]

[Means for Solving the Problem] In order to attain the above-mentioned purpose invention according to claim 1 The mounting section made from a ceramic is prepared in the inner pars basilaris ossis occipitalis of the container formed with the ceramic. In the ceramic package constituted so that it might be a metal-electrode film for securing a flow with the exterior in this mounting section upper surface, a thing with the gold plate layer might be prepared in a surface and it might be made to fix and flow through a crystal blank and a gold plate layer in an electroconductive glue By pasting up the outcrop and electroconductive glue of a ceramic which were obtained by removing some above-mentioned metal-electrode films [at least], it is characterized by constituting so that the adhesive strength between a metal-electrode film and a crystal blank may be reinforced Invention of a claim 2 prepares the mounting section made from a ceramic in the inner pars basilaris ossis occipitalis of the container formed with the ceramic. In the ceramic package constituted so that it might be a metal-electrode film for securing a flow with the exterior in this mounting section upper surface, a thing with the gold plate layer might be prepared in a surface and it might be made to fix and flow through a crystal blank and a gold plate layer in an electroconductive glue While having the metal-electrode film which carried out the laminating of the golden thin film to the nickel layer one by one on the tungsten layer formed on the above-mentioned mounting section By fixing a ceramic layer on the tungsten layer of the next door of this metal-electrode film, and pasting up the outcrop and electroconductive glue of a ceramic which were obtained by removing some above-mentioned metal-electrode films [at least] It is characterized by constituting so that the adhesive strength between a metal-electrode film and a crystal blank may be reinforced. Invention of a claim 3 is characterized by the above-mentioned outcrop consisting of small area and two or more outcrops.

[0005]

[Embodiments of the Invention] Hereafter, based on the drawing in which the example of a gestalt of this invention is shown, it explains in detail. drawing 1 (a) And (b) it is drawing of longitudinal section and the plan of one example of a ceramic package concerning this invention, and forms with a ceramic -- having -- the upper surface -- opening -- the metal-electrode film 5 is formed in the upper surface of the mounting section 2 which protruded on the inner pars basilaris ossis occipitalis of the container 1 of an enclosed type the bottom This metal-electrode film 5 carries out plating formation of nickel layer 5b and the golden thin film 5c one by one, after forming tungsten layer 5a on the mounting section made from a ceramic. In addition, a tungsten layer is solidified by making a solvent evaporate by calcinating this all over a furnace, after carrying out printing formation of the tungsten in the state where it dissolved into the solvent, using a predetermined mask on the mounting section of the ceramic container before baking. In addition, since the bond strength of the golden thin film 5c and the electroconductive glues (for example, silver filler adhesives etc.) which are located in the surface of the metal-electrode film 5 is not enough, it is as above-mentioned that the fault in which an electroconductive glue tends to exfoliate from a metal-electrode film front face consists.

[0006] The point of having made the electroconductive glue 4 paste up the ceramic portion of a container 1 and directly, and having strengthened the bonding strength has the characteristic composition of this example of a gestalt by removing some above-mentioned metal-electrode films 5, and making a part of upper surface of the mounting section made from a ceramic expose. That is, in the example of a gestalt of drawing 1 , it considers as the notch **** ceramic outcrop 8 like illustration of the edge center section where the two mounting sections 2 by which opposite arrangement was carried out counter each other, and after applying to the metal-electrode film 5 and the ceramic outcrop 8 and applying an electroconductive glue 4, the crystal blank 3 is laid on it. In addition, as the excitation electrode 6 of a crystal blank is shown in drawing 2 , vacuum evaporationo is made from across so that it may apply not only to vertical both sides but to an end face from an edge corner and may adhere. Consequently, the edge of the crystal blank 3 is laid on the metal-electrode film 5, and the electric connection between the excitation electrode 6 and an electroconductive glue 4 becomes certain only by making it dry. After laying the crystal blank edge on the binder made from electric conduction, adhesives are applied from on the (2nd application), and it becomes unnecessary that is, to attain certain-ization of a flow. After it may form the configuration of the electrode itself beforehand so that it may become such a configuration, and a flat-surface configuration forms a rectangular electrode layer, you may make it such a formation method of the metal-electrode film 5 remove a part by etching.

[0007] Drawing 3 (a) (b) It is explanatory drawing which illustrates the state where the crystal blank was pasted up by conductive adhesion. Although width of face of an outcrop 8 may be made larger than the width of face of a crystal blank, and you may narrow or it is good also as equivalent, adhesives 4 the rate of golden thin film 5c, the area to paste up, and an outcrop 8 and the area to paste up To the former being 30 - 70%, it sets up so that the latter may become 70 - 30% of within the limits. When area which adheres the area in which adhesives adhere to a ceramic exposed surface to a golden thin film at 80% is carried out 20% temporarily, electric resistance becomes excessive and the property of a device gets worse. as the configuration of an outcrop 8 -- a rectangle [like / illustration] -- it is not necessary to be -- **, such as a semicircle, a polygon, a star, a cross

and an indeterminate form, -- many things can be selected Moreover, as shown in drawing 4 , you may form an outcrop 8 in the center section of the metal-electrode film 5. The rate of the adhesion area of the adhesives in this case is set up so that it may become the above-mentioned range.

[0008] In addition, although it constituted from an above-mentioned example so that a ceramic portion might be exposed to an outcrop 8. TANGUGU stainless steel layer 5a is exposed, and you may make it paste up a tungsten layer and an electroconductive glue. This point is the same also in other examples described below. By using the package equipped with the above-mentioned composition, the bond strength of an electroconductive glue 4 and the metal-electrode film 5 on the mounting section 2 will improve sharply rather than the conventional case.

[0009] Next, in the above-mentioned example, the number of outcrops 8 is one, and moreover, since the area of an outcrop is large, the application position of adhesives shifts and an excessive amount may be applied on an outcrop 8. In such a case, the area of the adhesives occupied on the metal-electrode film 5 becomes [too little], and increase of electric resistance occurs. Drawing 5 (a) (b) And (c) It is the important section plan showing other drawings of longitudinal section, plans, and connection states of the example of a gestalt for solving such fault, and the package of this example of a gestalt has the composition characteristic of the edge which the metal-electrode film 5 formed on the two mounting sections 2 which counter each other counters for each other which arranged the outcrop 8 of two or more **** (facet product). In this example of a gestalt, although the configuration of each outcrop 8 is narrow width band-like, it cannot pass over this to an example, but configurations of ******, such as the shape of a triangle and elliptical, can be used for it for it. Or as shown in drawing 6 , you may form an outcrop 8 in the interior instead of the edge of the metal-electrode film 5 again. Or you may arrange the outcrop of small area, such as a rectangle and a round shape, regularly or in the shape of a dispersion pattern. The rate of adhesion surface ratio of the electroconductive glue 4 in this example of a gestalt is set up so that adhesives 4 may become 70 - 30% of within the limits about the latter comparatively to making [of a golden thin film, the area to paste up, and an outcrop 8 and the area to paste up] the former into 30 - 70% as explained in the above-mentioned example of a gestalt. Increase of electric resistance can be prevented by this. The sudden condition which becomes easy to secure the adhesion state of the electroconductive glue by the above-mentioned rate though the application position of an electroconductive glue shifts somewhat compared with the case of the 1st example of a gestalt which formed one exposure 7 of extensive area according to this example of a gestalt, and originated in the weakness of the adhesive strength of an electroconductive glue 4 and the golden thin film 5 is solvable. Thus, the yield of a product can be improved rather than the above-mentioned example of a gestalt by deforming.

[0010] In addition, drawing 7 (a) (b) It is other examples of this invention, and while forming nickel and a golden thin film on a tungsten layer and adjoining and forming the ceramic layer 10 next to it, it is made to reinforce the fall of the adhesive strength between a crystal blank and a golden thin film by making an electroconductive glue adhere ranging over both the layer top. (a) It is the example which is in agreement with the height of the golden thin film which the height of ** and the ceramic layer 10 adjoins, and is (b). The height of the ceramic layer 10 is an example of a low. (b) **** -- you may make the ceramic layer 10 conversely lower than a golden thin film In addition, although the device which used the crystal blank is illustrated in the above-mentioned example, it may not pass over this to an example, but it may be what piezoelectric material. It may follow, for example, a piezo-electric ceramic may be used. Moreover, as a gestalt of piezoelectric material, although the drawing showed the convex blank, you may use a bevel polish blank, a flat blank, a mesa type blank, etc. besides this. In addition, although the excitation electrode 7 which consists of gold etc., respectively is formed in front reverse side both sides of the crystal blank 3 of vacuum evaporationo etc., since the adhesion field of a crystal blank and an electroconductive glue spreads out also into the portion which crystal blanks other than a golden electrode have exposed, ablation is not generated between an electroconductive glue 4 and the crystal blank 3.

[0011]

[Effect of the Invention] Since this invention pasted up the outcrop and electroconductive glue of a ceramic which were obtained by removing some metal-electrode films [at least] as explained above, it can reinforce the adhesive strength between a metal-electrode film and a crystal blank, and can prevent generating of the situation where piezoelectric devices, such as a crystal blank, exfoliate and drop out of the polar zone of a package. Moreover, since the ceramic layer was fixed on the tungsten layer of the next door of this metal-electrode film while having the metal-electrode film which carried out the laminating of the golden thin film to the nickel layer one by one on the tungsten layer formed on the above-mentioned mounting section, piezoelectric devices, such as a crystal blank, can prevent generating of the situation which exfoliates and drops out of the polar zone of a package. Moreover, the above-mentioned outcrop does a remarkable effect so, when making the bond strength of an electroconductive glue and the electrode on the mounting section improve and losing ablation of the piezo-electric blank by external force, such as a shock, since it consists of small area and two or more outcrops.

TECHNICAL FIELD

[The technical field to which invention belongs] Especially this invention relates to the structure of the ceramic package which raised the electrical installation nature of the mounting section formed in the base in a ceramic

package in order to support piezo-electric blanks, such as a crystal blank, and this piezo-electric blank about improvement of the package structure of a piezo-electric device.

PRIOR ART

[Description of the Prior Art] Small and light-ization of electronic equipment of **, such as various communication equipment and OA equipment, follows on progressing, a miniaturization is required also about the piezo-electric device which are built-in parts, and the surface mount type thing by which covering formation of the electrode was carried out is variously developed to the package exterior instead of the thing of the conventional lead type with which the long picture lead terminal was drawn by the package exterior as latest piezo-electric device. Moreover, it is more advantageous to have not supported a piezo-electric blank in the piezo-electric surface mount type device, on the exceptional substrate prepared in the package like the former as a internal structure of a piezo-electric device, in order to correspond to thin shape-ization of a device, but to adopt as the pars basilaris ossis occipitalis in a package what made the direct piezo-electricity blank the structure (direct mounting structure) fixed by electroconductive glues, such as silver filler adhesives. For example, in the piezo-electric device using the crystal blank as a quartz resonator, as shown in drawing 8 and drawing 9 , after fixing the crystal blank 3 by the electroconductive glue 4 on the metal-electrode film 5 prepared on the mounting section 2 which are two projected parts prepared in the inner pars basilaris ossis occipitalis of the container 1 formed with the ceramic, the ceramic package which closes up opening of a container 1 with a metal or the lid of a ceramic is common. Generally this metal-electrode film 5 is formed on the mounting section 2 of a ceramic by carrying out the laminating of a tungsten layer, a nickel-plating layer, and the gold plate thin film one by one. Conductivity of gold is good and the reason for making a gold plate thin film layer into a surface is the shell which cannot oxidize easily. However, since the junction force of gold with a tungsten is weak, it is making the nickel-plating layer intervene as an interlayer. the connection which is not illustrated to the external electrode 6 which formed the metal-electrode film 5 in the package exterior -- it connects through the conductor That is, the crystal blank 3 is fixed in the container 1 which the metal-electrode film 5 was beforehand formed on the mounting section 2 of the inner pars basilaris ossis occipitalis in the container 1 formed with this ceramic, and put the crystal blank 3 after applying the electroconductive glue 4 on the golden thin film which constitutes the surface of the metal-electrode film 5, as shown in drawing 2 , was made to harden the aforementioned electroconductive glue 4 by heating, and was formed with the ceramic. Then, it becomes a finished product as a piezo-electric device by closing opening of a container with a lid.

EFFECT OF THE INVENTION

[Effect of the Invention] Since this invention pasted up the outcrop and electroconductive glue of a ceramic which were obtained by removing some metal-electrode films [at least] as explained above, it can reinforce the adhesive strength between a metal-electrode film and a crystal blank, and can prevent generating of the situation where piezoelectric devices, such as a crystal blank, exfoliate and drop out of the electrode section of a package. Moreover, since the ceramic layer was fixed on the tungsten layer of the next door of this metal-electrode film while having the metal-electrode film which carried out the laminating of the golden thin film to the nickel layer one by one on the tungsten layer formed on the above-mentioned mounting section, piezoelectric devices, such as a crystal blank, can prevent generating of the situation which exfoliates and drops out of the electrode section of a package. Moreover, the above-mentioned outcrop does a remarkable effect so, when making the bond strength of an electroconductive glue and the electrode on the mounting section improve and losing exfoliation of the piezo-electric blank by external force, such as a shock, since it consists of small area and two or more outcrops.

TECHNICAL PROBLEM

[Problem(s) to be Solved by the Invention] However, if it was in the piezo-electric device of structure conventionally [above-mentioned], since the connection resilience of a crystal blank and the golden thin film which is the surface of the metal-electrode film 5 was not necessarily enough, when vibration and the shock were added to the piezo-electric device, the fault that a golden thin film and an electroconductive glue 4 exfoliated, and vibrator became a misfire occurred frequently. It is made in order that this invention may prevent generating of the fault of the piezo-electric device which used the package of the **** former mentioned above, and it aims at offering a ceramic package with the possible structure of improving the bond strength of the golden electrode on the mounting section prepared in the inner bottom of a ceramic package, and an electroconductive glue.

MEANS

[Means for Solving the Problem] In order to attain the above-mentioned purpose invention according to claim 1 The mounting section made from a ceramic is prepared in the inner pars basilaris ossis occipitalis of the container formed with the ceramic. In the ceramic package constituted so that it might be a metal-electrode film for securing a flow with the exterior in this mounting section upper surface, a thing with the gold plate layer might be prepared in a surface and it might be made to fix and flow through a crystal blank and a gold plate layer in an electroconductive glue By pasting up the outcrop and electroconductive glue of a ceramic which were obtained by removing some above-mentioned metal-electrode films [at least], it is characterized by constituting so that the adhesive strength between a metal-electrode film and a crystal blank may be reinforced Invention of a claim 2 prepares the mounting section made from a ceramic in the inner pars basilaris ossis occipitalis of the container formed with the ceramic. In the ceramic package constituted so that it might be a metal-electrode film for securing a flow with the exterior in this mounting section upper surface. a thing with the gold plate layer might be prepared in a surface and it might be made to fix and flow through a crystal blank and a gold plate layer in an electroconductive glue While having the metal-electrode film which carried out the laminating of the golden thin film to the nickel layer one by one on the tungsten layer formed on the above-mentioned mounting section By fixing a ceramic layer on the tungsten layer of the next door of this metal-electrode film. and pasting up the outcrop and electroconductive glue of a ceramic which were obtained by removing some above-mentioned metal-electrode films [at least] It is characterized by constituting so that the adhesive strength between a metal-electrode film and a crystal blank may be reinforced. Invention of a claim 3 is characterized by the above-mentioned outcrop consisting of small area and two or more outcrops.
[0005]
[Embodiments of the Invention] Hereafter, based on the drawing in which the example of a gestalt of this invention is shown, it explains in detail. drawing 1 (a) And (b) it is drawing of longitudinal section and the plan of one example of a ceramic package concerning this invention, and forms with a ceramic -- having -- the upper surface -- opening -- the metal-electrode film 5 is formed in the upper surface of the mounting section 2 which protruded on the inner pars basilaris ossis occipitalis of the container 1 of an enclosed type the bottom This metal-electrode film 5 carries out plating formation of nickel layer 5b and the golden thin film 5c one by one, after forming tungsten layer 5a on the mounting section made from a ceramic. In addition, a tungsten layer is solidified by making a solvent evaporate by calcinating this all over a furnace, after carrying out printing formation of the tungsten in the state where it dissolved into the solvent, using a predetermined mask on the mounting section of the ceramic container before baking. In addition, since the bond strength of the golden thin film 5c and the electroconductive glues (for example, silver filler adhesives etc.) which are located in the surface of the metal-electrode film 5 is not enough, it is as above-mentioned that the fault in which an electroconductive glue tends to exfoliate from a metal-electrode film front face consists.
[0006] The point of having made the electroconductive glue 4 paste up the ceramic portion of a container 1 and directly, and having strengthened the bonding strength has the characteristic composition of this example of a gestalt by removing some above-mentioned metal-electrode films 5, and making a part of upper surface of the mounting section made from a ceramic expose. That is, in the example of a gestalt of drawing 1 , it considers as the notch **** ceramic outcrop 8 like illustration of the edge center section where the two mounting sections 2 by which opposite arrangement was carried out counter each other, and after applying to the metal-electrode film 5 and the ceramic outcrop 8 and applying an electroconductive glue 4, the crystal blank 3 is laid on it. In addition, as the excitation electrode 6 of a crystal blank is shown in drawing 2 , vacuum evaporationo is made from across so that it may apply not only to vertical both sides but to an end face from an edge corner and may adhere. Consequently, the edge of the crystal blank 3 is laid on the metal-electrode film 5, and the electric connection between the excitation electrode 6 and an electroconductive glue 4 becomes certain only by making it dry. After laying the crystal blank edge on the binder made from electric conduction, adhesives are applied from on the (2nd application), and it becomes unnecessary that is, to attain certain-ization of a flow. After it may form the configuration of the electrode itself beforehand so that it may become such a configuration, and a flat-surface configuration forms a rectangular electrode layer, you may make it such a formation method of the metal-electrode film 5 remove a part by etching.
[0007] Drawing 3 (a) (b) It is explanatory drawing which illustrates the state where the crystal blank was pasted up by conductive adhesion. Although width of face of an outcrop 8 may be made larger than the width of face of a crystal blank, and you may narrow or it is good also as equivalent. adhesives 4 the rate of golden thin film 5c, the area to paste up, and an outcrop 8 and the area to paste up To the former being 30 - 70%, it sets up so that the latter may become 70 - 30% of within the limits. When area which adheres the area in which adhesives adhere to a ceramic exposed surface to a golden thin film at 80% is carried out 20% temporarily, electric resistance becomes excessive and the property of a device gets worse. as the configuration of an outcrop 8 -- a rectangle [like / illustration] -- it is not necessary to be -- **, such as a semicircle, a polygon, a star, a cross and an indeterminate form, -- many things can be selected Moreover, as shown in drawing 4 , you may form an outcrop 8 in the center section of the metal-electrode film 5. The rate of the adhesion area of the adhesives in this case is set up so that it may become the above-mentioned range.
[0008] In addition, although it constituted from an above-mentioned example so that a ceramic portion might be exposed to an outcrop 8, TANGUGU stainless steel layer 5a is exposed, and you may make it paste up a tungsten layer and an electroconductive glue. This point is the same also in other examples described below. By

using the package equipped with the above-mentioned composition, the bond strength of an electroconductive glue 4 and the metal-electrode film 5 on the mounting section 2 will improve sharply rather than the conventional case.

[0009] Next, in the above-mentioned example, the number of outcrops 8 is one, and moreover, since the area of an outcrop is large, the application position of adhesives shifts and an excessive amount may be applied on an outcrop 8. In such a case, the area of the adhesives occupied on the metal-electrode film 5 becomes [too little], and increase of electric resistance occurs. Drawing 5 (a) (b) And (c) It is the important section plan showing other drawings of longitudinal section, plans, and connection states of the example of a gestalt for solving such fault, and the package of this example of a gestalt has the composition characteristic of the edge which the metal-electrode film 5 formed on the two mounting sections 2 which counter each other counters for each other which arranged the outcrop 8 of two or more **** (facet product). In this example of a gestalt, although the configuration of each outcrop 8 is narrow width band-like, it cannot pass over this to an example, but configurations of ******, such as the shape of a triangle and elliptical, can be used for it for it. Or as shown in drawing 6 , you may form an outcrop 8 in the interior instead of the edge of the metal-electrode film 5 again. Or you may arrange the outcrop of small area, such as a rectangle and a round shape, regularly or in the shape of a dispersion pattern. The rate of adhesion surface ratio of the electroconductive glue 4 in this example of a gestalt is set up so that adhesives 4 may become 70 - 30% of within the limits about the latter comparatively to making [of a golden thin film, the area to paste up, and an outcrop 8 and the area to paste up] the former into 30 - 70% as explained in the above-mentioned example of a gestalt. Increase of electric resistance can be prevented by this. The sudden condition which becomes easy to secure the adhesion state of the electroconductive glue by the above-mentioned rate though the application position of an electroconductive glue shifts somewhat compared with the case of the 1st example of a gestalt which formed one exposure 7 of extensive area according to this example of a gestalt, and originated in the weakness of the adhesive strength of an electroconductive glue 4 and the golden thin film 5 is solvable. Thus, the yield of a product can be improved rather than the above-mentioned example of a gestalt by deforming.

[0010] In addition, drawing 7 (a) (b) It is other examples of this invention, and while forming nickel and a golden thin film on a tungsten layer and adjoining and forming the ceramic layer 10 next to it, it is made to reinforce the fall of the adhesive strength between a crystal blank and a golden thin film by making an electroconductive glue adhere ranging over both the layer top. (a) It is the example which is in agreement with the height of the golden thin film which the height of ** and the ceramic layer 10 adjoins, and is (b). The height of the ceramic layer 10 is an example of a low. (b) **** -- you may make the ceramic layer 10 conversely lower than a golden thin film In addition, although the device which used the crystal blank is illustrated in the above-mentioned example, it may not pass over this to an example, but it may be what piezoelectric material. It may follow, for example, a piezo-electric ceramic may be used. Moreover, as a gestalt of piezoelectric material, although the drawing showed the convex blank, you may use a bevel polish blank, a flat blank, a mesa type blank, etc. besides this. In addition, although the excitation electrode 7 which consists of gold etc., respectively is formed in front reverse side both sides of the crystal blank 3 of vacuum evaporationo etc., since the adhesion field of a crystal blank and an electroconductive glue spreads out also into the portion which crystal blanks other than a golden electrode have exposed, ablation is not generated between an electroconductive glue 4 and the crystal blank 3.

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] (a) And (b) Drawing of longitudinal section and the plan of the example of 1 gestalt of a ceramic package concerning this invention.

[Drawing 2] Drawing showing the formation method of an excitation electrode.

[Drawing 3] (a) And (b) Important section plan of the example of the 1st gestalt.

[Drawing 4] The important section plan of the modification of the 1st example.

[Drawing 5] (a) (b) And (c) Drawing of longitudinal section, plan, and important section plan of the example of the 2nd gestalt of this invention.

[Drawing 6] The important section plan of the modification of the example of the 2nd gestalt of this invention.

[Drawing 7] (a) And (b) Cross section showing the important section composition of other examples of this invention.

[Drawing 8] (a) And (b) Drawing of longitudinal section of the conventional package and a plan, and (c) Important section cross section.

[Drawing 9] (a) And (b) Drawing of longitudinal section and the plan of the conventional example in the state where the crystal blank was carried.

[Description of Notations]

1 A container, 2 The mounting section, 3 A piezo-electric blank, 4 An electroconductive glue, 5 A metal-electrode film, 6 An external electrode, 7 An excitation electrode, 8 An outcrop, 10 Ceramic layer.

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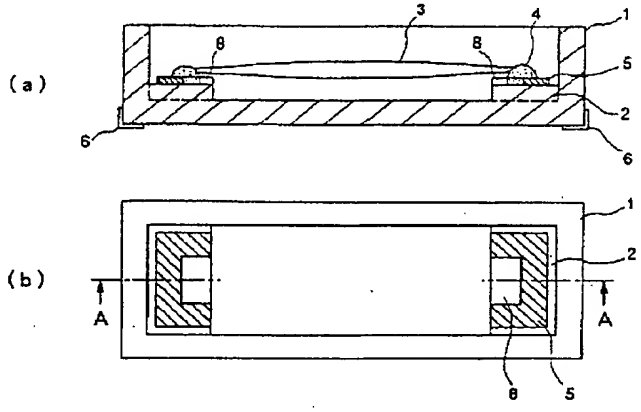
(54)【発明の名称】　セラミックパッケージの構造

(57)【要約】

【課題】　セラミックパッケージの内底部に設けられたマウント部上の金電極と導電性接着剤との接着強度を向上することの可能な構造を持つセラミックパッケージを提供する。

【解決手段】セラミックで形成された容器の内底部にセラミック製のマウント部を設け、該マウント部上面に外部との導通を確保するための金属電極膜であって表層に金メッキ層を有したものを設け、水晶素板と金メッキ層とを導電性接着剤で固定し導通させる様に構成されたセラミックパッケージにおいて、上記金属電極膜の少なくとも一部を除去することにより得たセラミックの露出部と導電性接着剤とを接着させることにより、金属電極膜と水晶素板との間の接着力を補強するように構成した。



【特許請求の範囲】

【請求項１】　セラミックで形成された容器の内底部にセラミック製のマウント部を設け、該マウント部上面に外部との導通を確保するための金属電極膜であって表層に金メッキ層を有したものを設け、水晶素板と金メッキ層とを導電性接着剤で固定し導通させる様に構成されたセラミックパッケージにおいて、

上記金属電極膜の少なくとも一部を除去することにより得たセラミックの露出部と導電性接着剤とを接着させることにより、金属電極膜と水晶素板との間の接着力を補強するように構成したことを特徴とするセラミックパッケージの構造。

【請求項２】　セラミックで形成された容器の内底部にセラミック製のマウント部を設け、該マウント部上面に外部との導通を確保するための金属電極膜であって表層に金メッキ層を有したものを設け、水晶素板と金メッキ層とを導電性接着剤で固定し導通させる様に構成されたセラミックパッケージにおいて、

上記マウント部上に形成したタングステン層上に、ニッケル層と金薄膜を順次積層した金属電極膜を備えると共に、該金属電極膜の隣のタングステン層上にセラミック層を固定し、

上記金属電極膜の少なくとも一部を除去することにより得たセラミックの露出部と導電性接着剤とを接着させることにより、金属電極膜と水晶素板との間の接着力を補強するように構成したことを特徴とするセラミックパッケージの構造。

【請求項３】　上記露出部が、小面積且つ複数の露出部から構成されていることを特徴とする請求項１又は２記載のセラミックパッケージの構造。

【発明の詳細な説明】

【０００１】

【発明の属する技術分野】本発明は圧電デバイスのパッケージ構造の改良に関し、特に水晶素板等の圧電素板を支持する為にセラミックパッケージ内底面に形成されるマウント部と、該圧電素板との電気的接続性を高めたセラミックパッケージの構造に関する。

【０００２】

【従来の技術】各種通信機器、ＯＡ機器等々の電子機器の軽薄短小化が進むに伴い、内蔵部品である圧電デバイスについても小型化が要求され、最近の圧電デバイスとしては、パッケージ外部に長尺なリード端子が導出された旧来のリードタイプのものに代わって、パッケージ外部に電極が被覆形成された表面実装型のものが種々開発されている。また、表面実装型の圧電デバイスにおいても、機器の薄型化に対応するためには圧電デバイスの内部構造として、従来の様にパッケージ内に設けた格別の基板上に圧電素板を支持するのではなく、パッケージ内底部に直接圧電素板を銀フィラー接着剤等の導電性接着剤で固定する構造（ダイレクトマウント構造）にしたも

のを採用した方が有利である。例えば、水晶振動子としての水晶素板を用いた圧電デバイスに於いては、図８、図９に示すようにセラミックで形成された容器１の内底部に設けられた２か所の突部であるマウント部２上に設けた金属電極膜５上に、水晶素板３を導電性接着剤４によって固定した上で、容器１の上部開口を金属やセラミックの蓋で封止するセラミックパッケージが一般的である。この金属電極膜５は、一般にはセラミックのマウント部２上にタングステン層、ニッケルメッキ層、金メッキ薄膜を順次積層することにより形成される。金メッキ薄膜層を表層にする理由は、金は導電性が良好であり、且つ酸化しにくいからである。しかし、金は、タングステンとの接合力が弱い為に、ニッケルメッキ層を中間層として介在させている。金属電極膜５はパッケージ外部に設けた外部電極６に対して図示しない接続導体を介して接続されている。即ち、このセラミックで形成された容器１内の内底部のマウント部２上には予め金属電極膜５が形成されており、図２に示すように金属電極膜５の表層を構成する金薄膜上に導電性接着剤４を塗布した上で水晶素板３を乗せ、加熱により前記導電性接着剤４を硬化させてセラミックで形成された容器１内に水晶素板３を固定する。その後、容器の開口部を蓋により封止することにより、圧電デバイスとして完成品となる。

【０００３】

【発明が解決しようとする課題】しかしながら、上記従来構造の圧電デバイスにあっては、水晶素板と金属電極膜５の表層である金薄膜との接続強度が必ずしも十分ではないため、圧電デバイスに対して振動や衝撃が加わると、金薄膜と導電性接着剤４とが剥離して振動子が不発になるという不具合が頻繁に発生した。本発明は上述した如き従来のパッケージを使用した圧電デバイスの不具合の発生を防ぐためになされたものであって、セラミックパッケージの内底部に設けられたマウント部上の金電極と導電性接着剤との接着強度を向上することの可能な構造を持つセラミックパッケージを提供する事を目的とする。

【０００４】

【課題を解決するための手段】上述の目的を達成するため請求項１記載の発明は、セラミックで形成された容器の内底部にセラミック製のマウント部を設け、該マウント部上面に外部との導通を確保するための金属電極膜であって表層に金メッキ層を有したものを設け、水晶素板と金メッキ層とを導電性接着剤で固定し導通させる様に構成されたセラミックパッケージにおいて、上記金属電極膜の少なくとも一部を除去することにより得たセラミックの露出部と導電性接着剤とを接着させることにより、金属電極膜と水晶素板との間の接着力を補強するように構成したことを特徴とする。請求項２の発明は、セラミックで形成された容器の内底部にセラミック製のマウント部を設け、該マウント部上面に外部との導通を確

保するための金属電極膜であって表層に金メッキ層を有したものを設け、水晶素板と金メッキ層とを導電性接着剤で固定し導通させる様に構成されたセラミックパッケージにおいて、上記マウント部上に形成したタングステン層上に、ニッケル層と金薄膜を順次積層した金属電極膜を備えると共に、該金属電極膜の隣のタングステン層上にセラミック層を固定し、上記金属電極膜の少なくとも一部を除去することにより得たセラミックの露出部と導電性接着剤とを接着させることにより、金属電極膜と水晶素板との間の接着力を補強するように構成したことを特徴とする。請求項３の発明は、上記露出部が、小面積且つ複数の露出部から構成されていることを特徴とする。

【０００５】

【発明の実施の形態】以下、本発明の形態例を示す図面に基づいて詳細に説明する。図１(a) 及び(b) は本発明に係るセラミックパッケージの一実施例の縦断面図及び上面図であって、セラミックで形成され上面が開放した箱形の容器１の内底部に突設したマウント部２の上面には金属電極膜５が形成されている。この金属電極膜５は、例えば、セラミック製のマウント部上にタングステン層５ａを形成した後で、ニッケル層５ｂ、金薄膜５ｃを順次メッキ形成したものである。なお、タングステン層は、溶剤中に溶解した状態にあるタングステンを、焼成前のセラミック容器のマウント部上に所定のマスクを用いて印刷形成した後で、炉中においてこれを焼成することにより溶剤を蒸発せしめることにより固化される。なお、金属電極膜５の表層に位置する金薄膜５ｃと導電性接着剤（例えば、銀フィラー接着剤等）との接着強度が十分でないために、導電性接着剤が金属電極膜表面から剥離し易い欠点が存することは上述の通りである。

【０００６】本形態例の特徴的な構成は、上記金属電極膜５の一部を除去してセラミック製マウント部の上面の一部を露出せしめることにより、導電性接着剤４を容器１のセラミック部分と直接接着せしめて接合強度の強化を図った点にある。すなわち、図１の形態例では、対向配置された２つのマウント部２の互いに対向し合う端縁中央部を図示のように切欠いてセラミック露出部８とし、金属電極膜５とセラミック露出部８にかけて導電性接着剤４を塗布した上で、その上に水晶素板３を載置している。なお、水晶素板の励振電極６は、図２に示すように上下両面のみならず、端縁角部から端面にかけて付着するように、斜め方向から蒸着がなされる。この結果、金属電極膜５上に水晶素板３の端縁を載置し、乾燥させるだけで、励振電極６と導電性接着剤４との電気的な接続が確実となる。つまり、水晶素板端縁を導電製接着材の上に載置した後で、その上から接着剤を塗布（２度目の塗布）して導通の確実化を図る必要がなくなる。このような金属電極膜５の形成方法は、このような形状となるように予め電極自体の形状を形成してもよいし、

平面形状が矩形の電極膜を形成したあとでエッチングにより一部を除去するようにしてもよい。

【０００７】図３(a) (b) は導電性接着により水晶素板を接着した状態を例示する説明図であり、露出部８の幅を水晶素板の幅より広くしてもよいし、狭くしてもよいし、或は同等としてもよいが、接着剤４が金薄膜５ｃと接着する面積と、露出部８と接着する面積の割合は、前者が３０～７０％であるのに対して、後者が７０～３０％の範囲内となるように設定する。仮に、セラミック露出面に接着剤が付着する面積を８０％で、金薄膜に付着する面積を２０％した場合には、電気抵抗が過大となって、デバイスの特性が悪化する。露出部８の形状としては、図示のごとき、矩形である必要はなく、半円形、多角形、星形、十字形、不定形等々、種々選定可能である。また、図４に示した如く、金属電極膜５の中央部に露出部８を設けてもよい。この場合の接着剤の接着面積の割合は上記の範囲となるように設定する。

【０００８】なお、上記実施例では、露出部８にはセラミック部分が露出するように構成したが、タンググステン層５ａを露出させて、タングステン層と導電性接着剤とを接着するようにしてもよい。この点は、以下に述べる他の実施例に於ても同様である。上記構成を備えたパッケージを用いることにより、従来の場合よりも導電性接着剤４とマウント部２上の金属電極膜５との接着強度は大幅に向上することとなる。

【０００９】次に、上記実施例では、露出部８が一か所であり、しかも露出部の面積が大きい為、接着剤の塗布位置がずれて露出部８上に過大な量が塗布されることもある。このような場合には、金属電極膜５上に占める接着剤の面積が過小となり、電気的抵抗の増大が発生する。図５(a) (b) 及び(c) はこのような不具合を解決する為の他の形態例の縦断面図、平面図及び接続状態を示す要部平面図であり、この形態例のパッケージは、対向し合う２つのマウント部２上に形成された金属電極膜５の対向し合う端縁に複数の挟幅（小面積）の露出部８を配列した構成が特徴的である。この形態例では、各露出部８の形状は、細幅帯状となっているが、これも一例に過ぎず、三角形状、楕円形状、等々種々の形状を採用可能である。或はまた、図６に示すように、金属電極膜５の端縁ではなく、内部に露出部８を設けてもよい。或は、矩形、円形等の小面積の露出部を規則的、或は散点模様状に配列してもよい。この形態例における導電性接着剤４の接着面積比率は、上記形態例において説明した通り、接着剤４が金薄膜と接着する面積と、露出部８と接着する面積の割合が、前者を３０～７０％とするのに対して、後者を７０～３０％の範囲内となるように設定する。このことにより、電気抵抗の増大を防止できる。この形態例によれば、広面積の露出７を一か所設けた第１の形態例の場合に比べて、導電性接着剤の塗布位置が多少ずれたとしても、上記割合による導電性接着剤の接

着状態を確保し易くなり、導電性接着剤４と金薄膜５との接着力の弱さに起因した不意具合を解決できる。この様に変形することにより上記形態例よりも製品の歩留を向上できる。

【００１０】なお、図７(a)(b)は本発明の他の実施例であり、タングステン層の上に、ニッケル、金薄膜を形成する一方で、その隣にセラミック層１０を隣接して形成するとともに、導電性接着剤を両層の上に跨がって付着させることにより、水晶素板と金薄膜との間の接着力の低下を補強するようにしている。(a)は、セラミック層１０の高さが隣接する金薄膜の高さと一致している例であり、(b)はセラミック層１０の高さが低い例である。(b)とは逆にセラミック層１０を金薄膜よりも低くしてもよい。なお、上記実施例では、水晶素板を用いたデバイスを例示しているが、これは一例に過ぎず、どのような圧電材料であってもよい。従って、例えば圧電セラミックを用いてもよい。また、圧電材料の形態として、図面ではコンベックス素板を示したが、これ以外にも、ベベル研磨素板、フラット素板、メサ型素板等を用いてもよい。なお、水晶素板３の表裏両面には夫々金等から成る励振電極７が蒸着等により形成されているが、水晶素板と導電性接着剤との接着領域は金電極以外の水晶素板が露出している部分にも広がっているので、導電性接着剤４と水晶素板３との間では剥離は発生しない。

【００１１】

【発明の効果】本発明は、以上説明した如く、金属電極膜の少なくとも一部を除去することにより得たセラミックの露出部と導電性接着剤とを接着させたので、金属電極膜と水晶素板との間の接着力を補強することができ、水晶素板等の圧電素子がパッケージの電極部から剥離、

脱落する事態の発生を防止できる。また、上記マウント部上に形成したタングステン層上に、ニッケル層と金薄膜を順次積層した金属電極膜を備えると共に、該金属電極膜の隣のタングステン層上にセラミック層を固定したので、水晶素板等の圧電素子がパッケージの電極部から剥離、脱落する事態の発生を防止できる。また、上記露出部が、小面積且つ複数の露出部から構成されているので、導電性接着剤とマウント部上の電極との接着強度を向上せしめ、衝撃等の外力による圧電素板の剥離を無くす上で著しい効果を奏する。

【図面の簡単な説明】

【図１】(a)及び(b)は本発明に係るセラミックパッケージの一形態例の縦断面図及び上面図。

【図２】励振電極の形成方法を示す図。

【図３】(a)及び(b)は第１形態例の要部平面図。

【図４】第１の実施例の変形例の要部平面図。

【図５】(a)(b)及び(c)は本発明の第２形態例の縦断面図、平面図及び要部平面図。

【図６】本発明の第２形態例の変形例の要部平面図。

【図７】(a)及び(b)は本発明の他の実施例の要部構成を示す断面図。

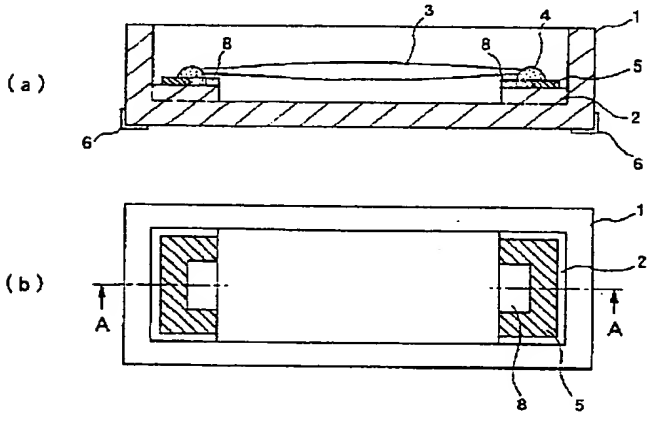
【図８】(a)及び(b)は従来のパッケージの縦断面図及び平面図、(c)は要部断面図。

【図９】(a)及び(b)は水晶素板を搭載した状態の従来例の縦断面図及び平面図。

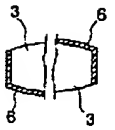
【符号の説明】

１　容器、２　マウント部、３　圧電素板、４　導電性接着剤、５　金属電極膜、６　外部電極、７　励振電極、８　露出部、１０　セラミック層。

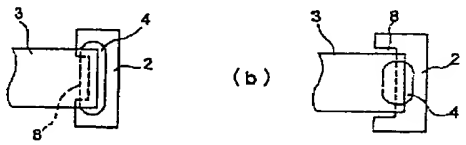
【図１】



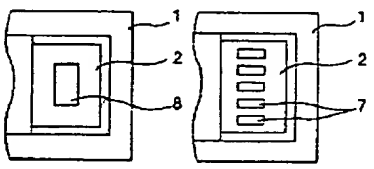
【図２】



【図３】

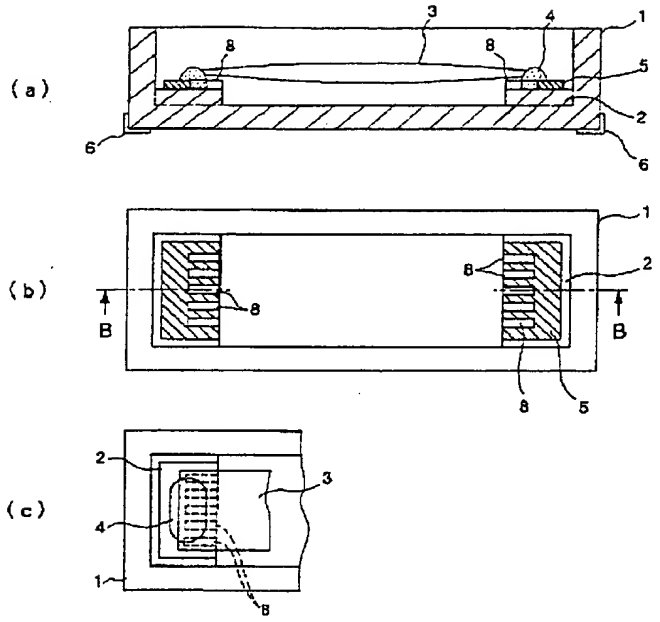


【図４】

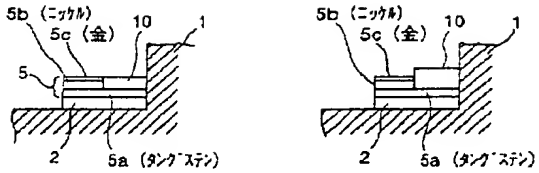


【図６】

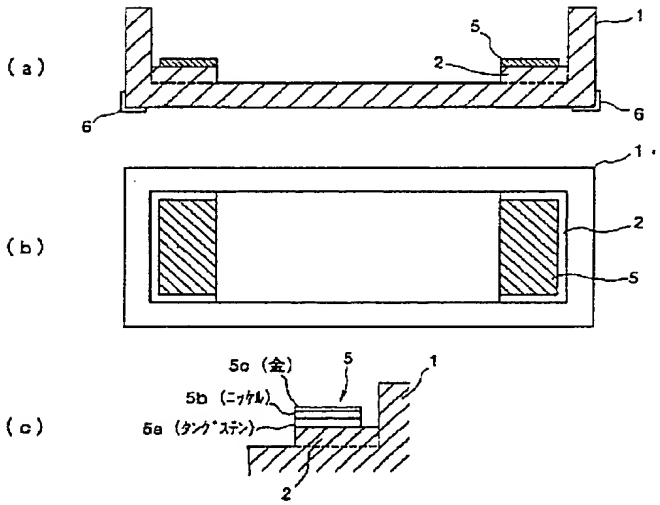
【図５】



【図７】



【図８】



【図９】